

WHAT IS CLAIMED IS:

1. A printing device for printing an image on a printing medium while performing main scanning, comprising:

5 a print head having a plurality of nozzle arrays, each of the nozzle arrays having a plurality of nozzles arranged along a sub-scanning direction for discharging a same ink,

wherein at least one pair of nozzle arrays for discharging different inks are positioned such that nozzles of the nozzle array pair  
10 are arranged in a staggered manner.

2. A printing device according to Claim 1, wherein the staggered nozzle array pair is connected to a pair of ink passages for supplying inks to the nozzle array pair, and

15 wherein the pair of ink passages is disposed inside of a same ink passage structure.

3. A printing device according to Claim 2, wherein the pair of ink passages have passage portions proximate to respective nozzles that  
20 protrude toward an opposite ink passage.

4. A printing device according to Claim 1, wherein at least a half of the plurality of nozzle arrays are configured to make a nozzle array pair arranged in a staggered manner.

25 5. A printing device according to Claim 1, wherein the printing device is capable of bi-directional printing;

wherein the plurality of nozzle arrays include four basic color  
30 nozzle arrays for discharging basic color inks of four basic colors of

black, cyan, magenta, and yellow, respectively, and a plurality of light ink nozzle arrays for discharging light inks of at least two of the four basic colors; and

5 wherein at least a pair of light ink nozzle arrays among the plurality of light ink nozzle arrays are arranged to have a same positional relationship at least in the sub-scanning direction as that of the staggered nozzle array pair.

10 6. A printing device according to Claim 5, wherein the plurality of light ink nozzle arrays include a light cyan nozzle array and a light magenta nozzle array, and the light cyan nozzle array and the light magenta nozzle array are arranged in a staggered manner.

15 7. A printing device according to Claim 5, wherein two basic color nozzle arrays for discharging basic color inks of cyan and magenta are arranged to have a same positional relationship at least in the sub-scanning direction as that of a nozzle array pair in a staggered arrangement.

20 8. A printing device according to Claim 1, further comprising:  
a main scan driving mechanism configured to perform main scans by moving at least one of the print head and the printing medium;

25 a sub-scan driving mechanism configured to perform sub-scans by moving at least one of the print head and the printing medium;

a printing data memory for storing printing data; and  
a controller configured to control operations of the printing device:

30 wherein the staggered nozzle array pair consists of a leading nozzle array that reaches a leading edge of the printing medium

relatively earlier and a trailing nozzle array that reaches the leading edge relatively later when the sub-scan is performed,

wherein the controller is capable of:

(a) performing interlace recording where only a plurality of main scan lines separated one another are recorded by each nozzle array in a single main scan pass, and where recording of successive main scan lines is achieved by a plurality of main scan passes that include at least one sub-scan feed therebetween; and

(b) in the interlace recording, referring to the printing data memory prior to a main scan pass, for printing data of a plurality of main scan lines that correspond to an overall width in the sub-scanning direction of the staggered nozzle array pair, and performing the main scan pass according to the referenced printing data.

9. A printing device according to Claim 8, wherein the controller is further capable of:

(c) in the interlace recording, performing sub-scan feed such that a same main scan line is not recorded by two nozzles having a same ordinal nozzle number in the staggered nozzle array pair, but the same main scan line is recorded by two nozzles having different ordinal nozzle numbers in the staggered nozzle array pair.

10. A printing device according to Claim 8, wherein the controller is further capable of:

(d) performing the interlace recording according to a first recording mode in a midsection of a recording region on the printing medium, and performing printing according a second recording mode proximate to a leading edge of the recording region, the second printing method using a sub-scan feed amount smaller than that of the first recording mode; and

(e) in the printing proximate to the leading edge of the printing medium by the second recording mode, determining a leading edge of the recording region according to a range in the sub-scanning direction that is fully recordable by the leading nozzle array.

5 11. A printing device according to Claim 10, wherein the controller is further capable of:

(f) performing the interlace recording according to a third recording mode proximate to a trailing edge of the printing medium, the third recording mode using a sub-scan feed amount smaller than that  
10 of the first recording mode applied to the midsection; and

(g) in the printing proximate to the trailing edge of the printing medium by the third recording mode, determining a trailing edge of the recording region according to a range in the sub-scanning direction that is fully recordable by the trailing nozzle array.  
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12. A printing device according to Claim 11, wherein the controller is further capable of:

(h) during printing according the second recording mode, if an end nozzle at a leading edge of the leading nozzle array will exceed an  
20 expected trailing edge of the recording region due to a sub-scan feed according to the second recording mode, changing from the second recording mode to the third recording mode prior to the sub-scan feed.

13. A printing device according to Claim 8, wherein the  
25 staggered nozzle array pair is connected to a pair of ink passages for supplying inks to the nozzle array pair, and

wherein the pair of ink passages is disposed inside of a same ink passage structure.

30 14. A printing device according to Claim 13, wherein the pair of

ink passages have passage portions proximate to respective nozzles that protrude toward an opposite ink passage.

15. A printing device according to Claim 8, wherein at least a  
5 half of the plurality of nozzle arrays are configured to make a nozzle array pair arranged in a staggered manner.

16. A printing device according to Claim 8, wherein the plurality  
of nozzle arrays includes four basic color nozzle arrays for discharging  
10 basic color inks of four colors of black, cyan, magenta, and yellow, respectively; and

wherein the four basic color nozzle arrays are arranged in same positions with respect to the sub-scanning direction.

15 17. A print head used for a printing device for printing an image on a printing medium while performing main scanning, comprising:

a plurality of nozzle arrays each having a plurality of nozzles arranged along a sub-scanning direction for discharging a same ink,

18 wherein at least one pair of nozzle arrays for discharging  
20 different inks are positioned such that nozzles of the nozzle array pair are arranged in a staggered manner.

18. A print head according to Claim 17, wherein the staggered  
nozzle array pair is connected to a pair of ink passages for supplying  
25 inks to the nozzle array pair, and

wherein the pair of ink passages is disposed inside of a same ink passage structure.

19. A print head according to Claim 18, wherein the pair of ink  
30 passages have passage portions proximate to respective nozzles that

protrude toward an opposite ink passage.

20. A print head according to Claim 17, wherein at least a half of the plurality of nozzle arrays are configured to make a nozzle array pair  
5 arranged in a staggered manner.

21. A print head according to Claim 17, wherein the printing device is capable of bi-directional printing;

wherein the plurality of nozzle arrays include four basic color  
10 nozzle arrays for discharging basic color inks of four basic colors of black, cyan, magenta, and yellow, respectively, and a plurality of light ink nozzle arrays for discharging light inks of at least two of the four basic colors; and

wherein at least a pair of light ink nozzle arrays among the  
15 plurality of light ink nozzle arrays are arranged to have a same positional relationship at least in the sub-scanning direction as that of the staggered nozzle array pair.

22. A print head according to Claim 21, wherein the plurality of  
20 light ink nozzle arrays include a light cyan nozzle array and a light magenta nozzle array, and the light cyan nozzle array and the light magenta nozzle array are arranged in a staggered manner.

23. A print head according to Claim 22, wherein two basic color  
25 nozzle arrays for discharging basic color inks of cyan and magenta are arranged to have a same positional relationship at least in the sub-scanning direction as that of a nozzle array pair in a staggered arrangement.

30 24. A printing method comprising the steps of:

providing a print head having a plurality of nozzle arrays, each of the nozzle arrays having a plurality of nozzles arranged along a sub-scanning direction for discharging a same ink, at least one pair of nozzle arrays for discharging different inks being positioned such that nozzles of the nozzle array pair are arranged in a staggered manner, the staggered nozzle array pair consists of a leading nozzle array that reaches a leading edge of the printing medium relatively earlier and a trailing nozzle array that reaches the leading edge relatively later when the sub-scan is performed;

(a) performing interlace recording where only a plurality of main scan lines separated one another are recorded by each nozzle array in a single main scan pass, and where recording of successive main scan lines is achieved by a plurality of main scan passes that include at least one sub-scan feed therebetween; and

(b) in the interlace recording, referring to the printing data memory prior to a main scan pass, for printing data of a plurality of main scan lines that correspond to an overall width in the sub-scanning direction of the staggered nozzle array pair, and performing the main scan pass according to the referenced printing data.

25. A printing method according to Claim 24, wherein the step (a) comprises the step of:

(c) performing sub-scan feed such that a same main scan line is not recorded by two nozzles having a same ordinal nozzle number in the staggered nozzle array pair, but the same main scan line is recorded by two nozzles having different ordinal nozzle numbers in the staggered nozzle array pair.

26. A printing method according to Claim 24, wherein the step (a) further comprises the steps of:

(d) performing the interlace recording according to a first recording mode in a midsection of a recording region on the printing medium, and performing printing according a second recording mode proximate to a leading edge of the recording region, the second printing method using a sub-scan feed amount smaller than that of the first recording mode; and

(e) in the printing proximate to the leading edge of the printing medium by the second recording mode, determining a leading edge of the recording region according to a range in the sub-scanning direction that is fully recordable by the leading nozzle array.

27. A printing method according to Claim 26, wherein the step (a) further comprises the steps of:

(f) performing the interlace recording according to a third recording mode proximate to a trailing edge of the printing medium, the third recording mode using a sub-scan feed amount smaller than that of the first recording mode applied to the midsection; and

(g) in the printing proximate to the trailing edge of the printing medium by the third recording mode, determining a trailing edge of the recording region according to a range in the sub-scanning direction that is fully recordable by the trailing nozzle array.

28. A printing method according to Claim 27, wherein the step (a) further comprises the step of:

(h) during printing according the second recording mode, if an end nozzle at a leading edge of the leading nozzle array will exceed an expected trailing edge of the recording region due to a sub-scan feed according to the second recording mode, changing from the second recording mode to the third recording mode prior to the sub-scan feed.

29. A printing method according to Claim 24, wherein the



staggered nozzle array pair is connected to a pair of ink passages for supplying inks to the nozzle array pair, and

wherein the pair of ink passages is disposed inside of a same ink passage structure.

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30. A printing method according to Claim 29, wherein the pair of ink passages have passage portions proximate to respective nozzles that protrude toward an opposite ink passage.

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31. A printing method according to Claim 24, wherein at least a half of the plurality of nozzle arrays are configured to make a nozzle array pair arranged in a staggered manner.

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32. A printing method according to Claim 24, wherein the plurality of nozzle arrays includes four basic color nozzle arrays for discharging basic color inks of four colors of black, cyan, magenta, and yellow, respectively; and

wherein the four basic color nozzle arrays are arranged in same positions with respect to the sub-scanning direction.

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